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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/727,692      | 12/04/2003  | Jingkuang Chen       | D/A1591D            | 8664             |

7590 10/11/2005

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| EXAMINER |
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SCHILLINGER, LAURA M

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| ART UNIT | PAPER NUMBER |
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2813

DATE MAILED: 10/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

EK

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|------------------------------|---|------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/727,692    | <b>Applicant(s)</b><br>CHEN ET AL. |  |
|                              | <b>Examiner</b><br>Laura M. Schillinger | <b>Art Unit</b><br>2813            |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 20 July 2005.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-14 and 17-21 is/are pending in the application.
- 4a) Of the above claim(s) 21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-14 and 17-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. <u>10/07/05</u> |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)                                  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____   |

## **DETAILED ACTION**

### ***Election/Restrictions***

Newly submitted claim 21 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claim 21 constitutes a separate and distinct species from that of the original claims

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 21 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 13 rejected under 35 U.S.C. 102(a) as being clearly anticipated by Applicant's Admitted Prior Art (hereinafter referred to as "APA").

13. A heterogeneous device, comprising:

a substrate; and

a plurality of heterogeneous circuit devices defined in the substrate; and

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a photodiode defined in the substrate (see APA [0002]).

14. The device of claim 13, wherein the plurality of heterogeneous circuit devices comprises at least one complementary metal oxide semiconductor transistor and at least one double-diffused metal oxide semiconductor transistor (see APA [0002]).

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over APA as applied to claim 13 above, and further in view of Yoshida et al ('305).

APA teaches to form a heterogeneous device including photodiodes and CMOS structures, however fails to provide any details regarding the substrate such devices are formed upon.

Yoshida teaches the following claimed limitations as recited below:

17. (Original) The device of claim 13, wherein the substrate comprises a layer of silicon (Col.3, lines: 10-20).

18. (Original) The device of claim 17, wherein the layer of silicon comprises p- type silicon (Col.6, lines :10-20).

19. (Original) The device of claim 13, wherein the substrate comprises a silicon- on-insulator wafer comprising a single-crystal-silicon layer, a substrate and an insulator layer therebetween (Col.3 and 6, lines: 10-20).

20. (Original) The device of claim 19, wherein the single-crystal-silicon layer comprises p-type silicon (Col.6, lines: 10-20).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify APA's photodiode to further include the p-type single crystal SOI substrate as claimed, because SOI substrates are well known in the field of semiconductors and as Yoshida teaches, such substrates as suitable for photodiode applications (Col.3, lines: 10-20).

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-5, 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over APA as applied to claim 13 above, and further in view of Mei ('554).

APA teaches forming a heterogenous device including both CMOS, double diffused MOS and photodiodes, however fails to specify the following details as recited in claims 1-5 and 8-12:

However, Mei teaches the following claimed limitations:

1. The device of claim 13, further comprising:  
a high voltage well of a first circuit device defined in the substrate (Fig.1 (20, 40)); and  
a first low voltage well of a second circuit device defined in the substrate (Fig.1 (60, 80) .
3. The device of claim 1, further comprising at least one microelectromechanical system-based element defined in the substrate (CMOS- NMOS and PMOS).
4. (Original) The device of claim 1, wherein the substrate comprises a layer of silicon (Fig.1 (10).
5. (Original) The device of claim 4, wherein the layer of silicon comprises p- type silicon (Col.7, lines: 15-20).
8. (Original) The device of claim 1, further comprising a second low voltage well of the second circuit device defined in the substrate (Fig.1 (60 or 80).

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9. (Original) The device of claim 8, further comprising a field oxide layer over at least part of each of the high voltage well, the first low voltage well and the second low voltage well (Fig.3K (43)).

10. The device of claim 9, further comprising a polysilicon gate associated with each of the high voltage well, the first low voltage well and the second low voltage well (Fig.3N (G)).

11. (Original) The device of claim 10, further comprising:

a P-body defined in the high voltage well of the first circuit device (7-HV PMOS- (40));  
an N<sup>+</sup> source/drain defined in each of the P-body (7-HV PMOS (S)), the high voltage well (48)  
and the first low voltage well of the second circuit device (8-LV NMOS (S/D)); and  
a P<sup>+</sup> source/drain in each of the P-body (7-HV PMOS (D)) and the second low voltage well of the second circuit device (9-LV PMOS (S/D)).

12. (Original) The device of claim 11, further comprising:

a passivation oxide layer over at least the field oxide layer and the polysilicon gates (Fig. 4 (150));  
a plurality of vias through the passivation oxide layer (inherent- Fig.3N- line with circle on top labeled "S" "D" and "G" designates the source/drain/gate electrodes which cannot connect through the passivation without forming a via and without such connections; the device would be inoperable) ; and

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a plurality of contacts, each of the contacts extending through the vias and contacting at least one of the sources/drains (Fig. 1 (S/D)).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify APA to further include the high voltage and low voltage regions in accordance with Mei because as Mei teaches, such techniques are useful in CMOS, and double diffused MOS transistors (Col. 1, lines: 5-60).

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over APA and Mei as applied to claim 1 above, and further in view of Yoshida et al ('305).

APA and Mei teach the limitations of claim 1, including forming the devices on a p-type silicon substrate however fail to specify that the substrate is structured as an SOI

However Yoshida teaches the following claimed limitations:

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6. The device of claim 1, wherein the substrate comprises a silicon- on-insulator wafer comprising a single-crystal-silicon layer, a substrate and an insulator layer therebetween (Col.3 and 6, lines: 10-20).

7. The device of claim 6, wherein the single-crystal-silicon layer comprises p-type silicon (Col.3 and 6, lines: 10-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify APA and Mei's teachings to further include a SOI substrate because SOI are well known semiconductor substrates and moreover, Mei teaches that such a structure is suitable for photodiode applications(Col.3, lines: 10-20).

### ***Response to Arguments***

Applicant's arguments with respect to the current claims have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Laura M. Schillinger whose telephone number is (571) 272-1697. The examiner can normally be reached on M-T, R-F 7:00-5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Laura M. Schillinger', with a stylized, flowing script.

Laura M Schillinger  
Primary Examiner  
Art Unit 2813

10/07/05